

Bandpass Filter for Recycler Momentum System

Ding Sun
01/2003

A bandpass filter using short end stubs of strip line is made and installed in Recycler momentum system. This note describes the parameters and performance of this filter. The designed goal is to have -1 db bandwidth of 0.57 MHz centered at 0.875 GHz and steep drop at band edges (0.59 MHz and 1.16 MHz)

Shown in Figure 1 is a schematic drawing of this filter with each section numbered. Listed in Table 1 are line widths and lengths of these sections. Material for this filter is Arlon CuClad 233 45 mil certified board.

Shown in Figure 2 are measured S21 and S11 of the filter. The -1 db edge is at 0.569 GHz and 1.204 GHz. The -10 db drop is at 0.525 GHz and 1.247 GHz. The insertion loss within the pass band (flat top) is ~-0.5 dB. Shown in Figure 3 is measured phase with delay time 3.5041 ns.

The advantage of using short end stub over coupled line is that it does not require very stringent tolerance. Benefits of reducing tolerance are: (1) the time for prototyping may be reduced, (2) the circuit board can be made with cutting machine available within beam division (cost saving ~\$1000 per prototype) and (3) non-fatal circuit problem may be fixed by cutting and patching. For example, the filter with superior performance shown in Figure 2 actually has three places patched and soldered where the stub or transmission line are broken by cutting machine.

The disadvantage of using short end stub over coupled line is that the size is relatively large. However, this should not be a concern since there is always enough space to host a thin circuit board.

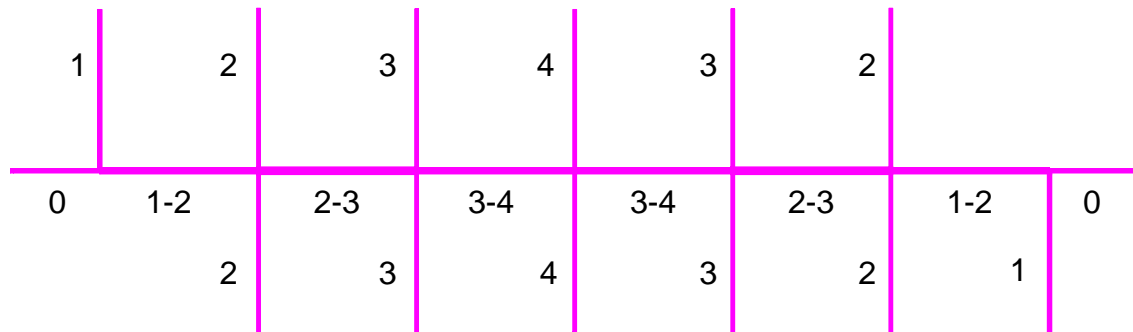


Figure 1. Schematic drawing of short end stub bandpass filter

Table 1. Line parameters

Line number	Width (mil)	Length (mil)
0	70	1200
1	64	2200
1-2	94	2200
2	62	2210
2-3	100	2200
3	58	2200
3-4	90	2200
4	52	2200

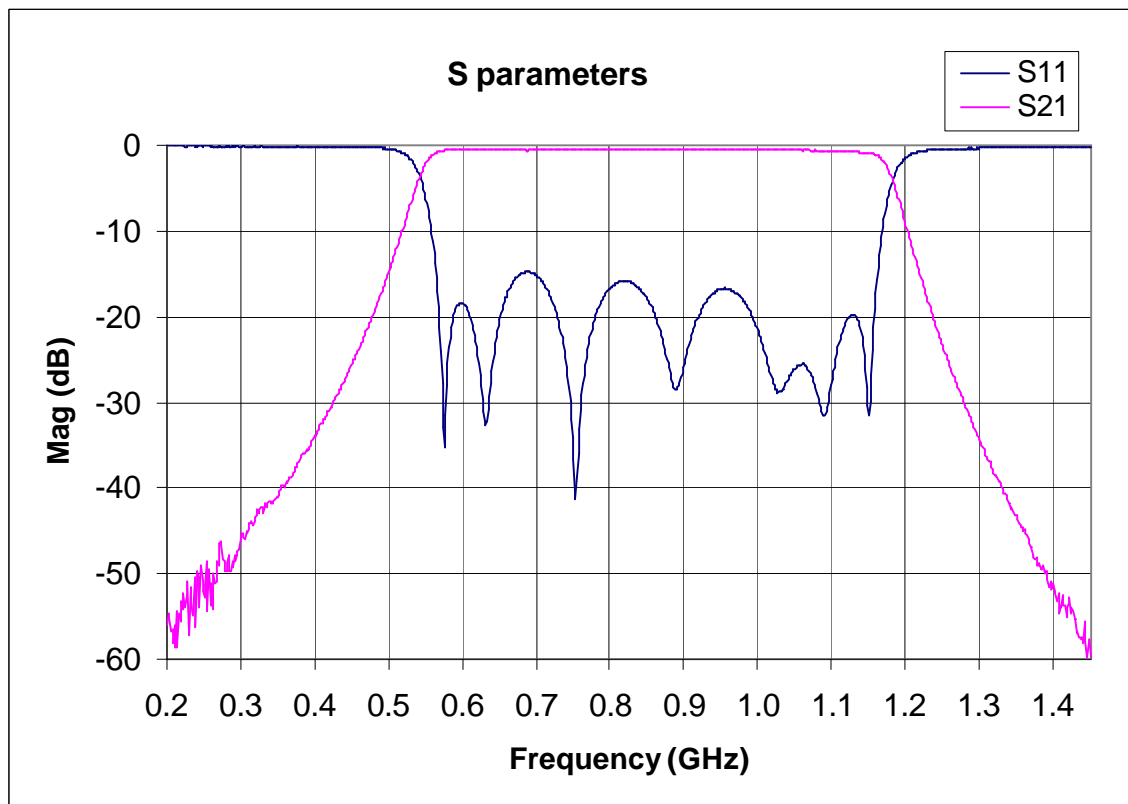


Figure 2. Measured S21 and S11 of Bandpass Filter for Recycler Momentum System

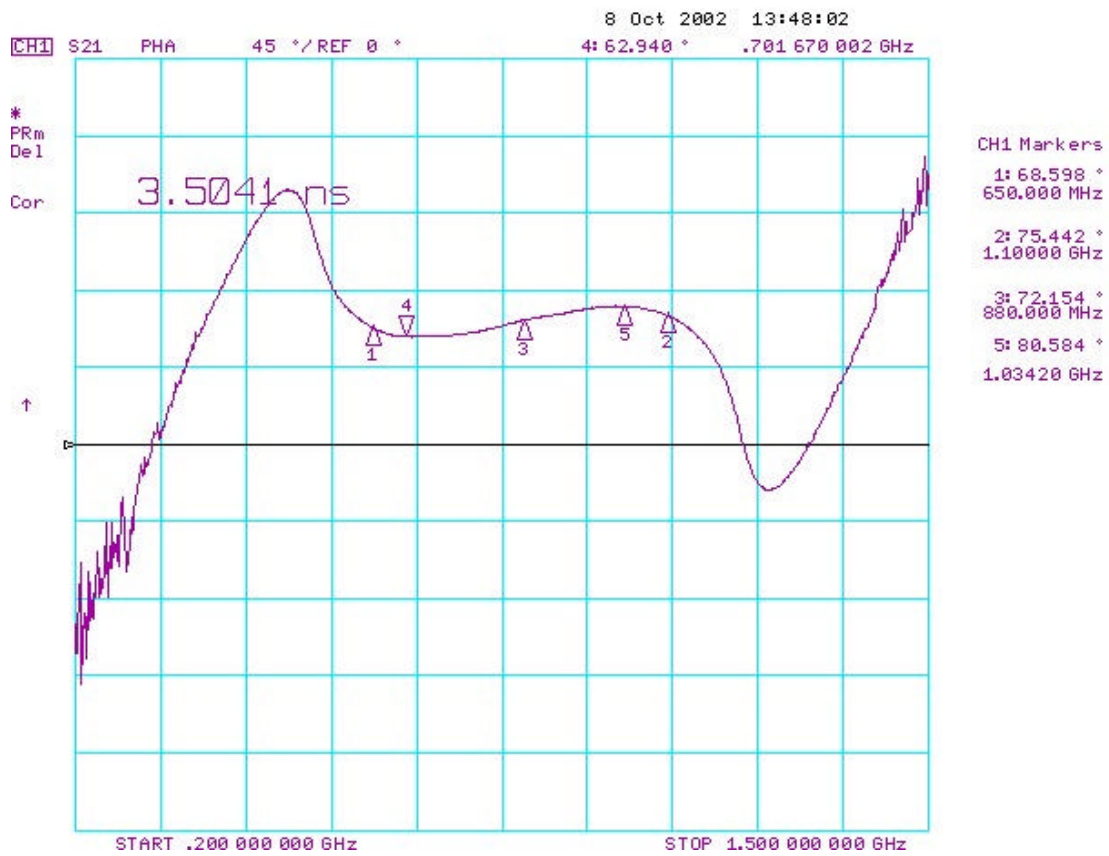


Figure 3. Measured phase (with 3.5401 ns of delay time.)